MYCOTAXON

Volume 111, pp. 11–18 *January–March 2010*

Ganoderma chalceum and *Junghuhnia meridionalis*: new records from Brazil

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Abstract — During a survey of the polypore fungi in the Morro Santana, Porto Alegre, in southern Brazil, two species never before recorded for the country were found. *Ganoderma chalceum* has a pileate basidiome, laccate pileus surface, dimitic hyphal system, and a cuticle composed of clavate and amyloid hyphae. *Junghuhnia meridionalis* has a resupinate basidiome, dimitic hyphal system, and heavily incrusted clavate cystidia. Both species are compared with related species and illustrations are provided.

Key words — *Polyporales, Ganodermataceae, Meruliaceae,* mycodiversity

Introduction

Despite little overall knowledge of the Brazilian mycobiota, several works on polypores have recently been published, including new species and new records for Brazil (Ryvarden & Meijer 2002, Gibertoni et al. 2004, Coelho 2005, Coelho et al. 2005, 2006; Drechlser-Santos et al. 2007, Martins Junior et al. 2008, Silva et al. 2008), indicating a growing interest in the subject on the part of Brazilian researchers.

Ganoderma P. Karst. comprises about 80 widespread species, mostly in tropical regions (Kirk et al. 2008). The genus is characterized by truncate double-walled basidiospores, with the inner wall ornamented and the outer one smooth, of a yellowish-brown color. *Amauroderma* Murrill has very similar characteristics, but it is differentiated by ovoid to ellipsoid non-truncate basidiospores (Ryvarden 1991). *G. applanatum* (Pers.) Pat. has been recorded from several regions of Brazil (Silveira & Guerrero 1991, Groposo & Loguercio-Leite 2005, Gibertoni & Cavalcanti 2003). However, according to Ryvarden (2004), this species is distributed in temperate zones, being very close to *G. australe* (Fr.) Pat., which occurs mainly in tropical zones. Other species recorded from Brazil are *G. lucidum* (Curtis) P. Karst. (Gibertoni & Cavalcanti

2003, Jesus 1996, Drechsler-Santos et al. 2008) and *G. resinaceum* Boud. (Reck & Silveira 2008, Gibertoni & Cavalcanti 2003, Groposo & Loguercio-Leite 2005), which are traditionally distinguished by the presence of stipe in the former and its absence in the latter. According to Gottlieb & Wright (1999), *G. lucidum* and *G. resinaceum* also differ in other characters, such as color of the context, reaction in the cuticle elements, and basidiospore ornamentation. Ryvarden (2000), nevertheless, considers that *G. lucidum* s. str., a species described from Europe with an almost white context, does not occur in tropical America, although many collections from the neotropics are deposited under this name in different American herbaria.

The genus *Junghuhnia* Corda contains approximately 20 species and is widespread throughout the world (Kirk et al. 2008). It is characterized by a dimitic hyphal system, small basidiospores, and large incrusted cystidia. Such microscopical characteristics are similar to those of *Steccherinum* Gray, though the latter has a hydnoid hymenophore. *Antrodiella* Ryvarden & I. Johans. is also similar to *Junghuhnia*, though it lacks cystidia (Ryvarden 1991). In recent works, species recorded from different regions of Brazil include: *J. nitida* (Pers.) Ryvarden (Silveira & Guerrero 1991, Gugliotta & Capelari 1995) *J. undigera* (Berk. & M.A. Curtis) Ryvarden (Silveira & Guerrero 1991, Drechsler-Santos et al. 2008, Baltazar et al. 2009), *J. polycystidifera* (Rick) Rajchenb. (Drechsler-Santos et al. 2008, Baltazar et al. 2009) and *J. crustacea* (Jungh.) Ryvarden (Baltazar et al. 2009).

In the state of Rio Grande do Sul, southern Brazil, Morro Santana (30°03' S, 51°07' W) has an area of about 1,000 hectares with altitudes varying from 30 to 311 m above sea level. The Morro Santana region is one of the last natural remnants in the urban area of Porto Alegre, comprising great biological diversity (Mohr & Porto 1998). The climate in the region is humid subtropical of the Cfa type according to the Köppen Climate Classification (Moreno 1961). The forests are mainly located on humid slopes facing the south (Aguiar et al. 1986). According to the RADAM BRASIL classification system, this forest is a Seasonal Semideciduous Forest (Leite 2002).

Materials and methods

Specimens were collected during 2007 in the region of the Morro Santana and kept at the ICN herbarium (UFRGS). For microscopy freehand sections of the basidiomes were mounted in a drop of 5% KOH solution and 1% phloxine solution. Amyloid or dextrinoid reactions were observed using Melzer's reagent. Drawings of the microstructures were made with the assistance of a camera lucida. The codes used for colors are from the color chart by Kornerup & Wanscher (1978). The abbreviations and codes for the measurements are modified from Coelho (2005), with Lm × Wm = means of length and width,

Q = range of length/width ratios, Qm = length/width mean, and n = x/y (x = number of measurements from a given number (y) of specimens).

Taxonomy

Ganoderma chalceum (Cooke) Steyaert
Bull. Jard. bot. natn. Belg. 37: 481, 1967. Figs 1–2, 5

Basidiomata perennial, pileate, sessile, dimidiate, semi-circular, corky to woody, 7 cm diam. and up to 2 cm thick; upper surface laccate, sulcate, glabrous, with a distinct cuticle in section, reddish-brown (9F5 – 9F8) with a lighter margin (8C3); pore surface beige (4C3) to pale brown (6D4), pores angular to circular, 3–5 per mm; tubes with thick dissepiments, pale brown (6D4–6E4), up to 3 mm deep; context brown (6E6–6F6) in section with a black resinous band starting at the base and extending almost to the margin.

Hyphal system dimitic. Generative hyphae with clamps, thin-walled, hyaline, 1.5–3.0 µm diam.; skeletal hyphae abundant, unbranched or sparingly branched, thick-walled, yellowish-brown, 2.0–7.0 µm diam.; n = 30/1. Cuticle with cylindrical to club-shaped hyphae, thick-walled, apically strongly amyloid. Basidia clavate, 4-sterigmate, hard to observe; basidiospores ellipsoid to narrowly ellipsoid, truncate, yellowish-brown, double-walled, inner wall verrucose and outer wall smooth, 9.5–11.5 × 6.0–7.0 µm, Lm × Wm = 10.4 × 6.5, Q = 1.4 – 1.9, Qm = 1.7, n = 30/1.

Culture description: Unknown

Substrata: On dead hardwoods.

Distribution: According to Ryvarden (2004) widespread in the paleotropical zone and known in the neotropical zone only from Colombia as *G. hollidayi* Steyaert (= *G. chalceum*).

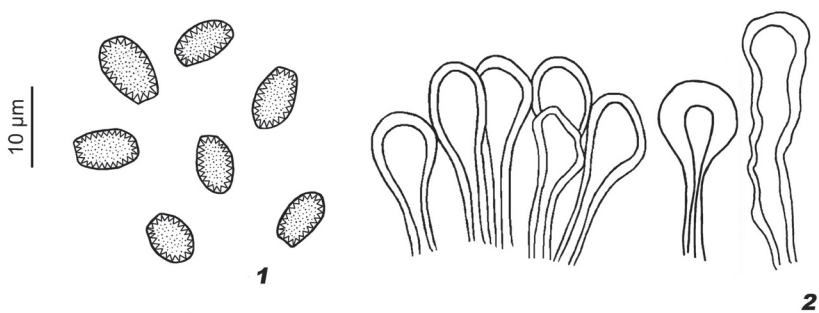

Fig. 1–2. Microscopic characters of *Ganoderma chalceum* (ICN 154096): 1. Basidiospores. 2. Cuticle hyphae

Specimen Examined: BRAZIL. Rio Grande do Sul State, municipality of Porto Alegre, Morro Santana, 11.V.2007, *leg. M.C. Westphalen 043/07* (ICN 154096).

Additional Specimens Examined: PANAMA. Santa Cruz, Parque Nacional Coiba, 17.XI.1996, *leg. M. Nuñez 1124* (O 913359); UGANDA. Sesse Island, *leg. Maitland s/n* (O 918172); ZAMBIA. Ndola, 22.III.1982, *leg. G.D. Pierce 715/2-3* (O 918173); BELIZE. Cayo, Blue Hole National Park, 15.XI.2001, *leg. Leif Ryvarden 44192* (O 17638 *Ganoderma stipitatum*); COSTA RICA. Bijagua, Tilaran, Parque Nacional Volcan Tenorio, 16.VII.2001, *leg. Leif Ryvarden 43820* (O 18649 *Ganoderma stipitatum*); ECUADOR. Orellana, Yasuni National Park, 9-12.III.2002, *leg. Leif Ryvarden 44573* (O 110173539 *Ganoderma elegantum* HOLOTYPE).

Remarks: *Ganoderma chalceum* is included in the *G. resinaceum* complex (Ryvarden 2004) and is characterized by the laccate upper surface, the lack of a stipe, the presence of a black resinous band in the context, and the amyloid cuticle. According to Ryvarden (2004), this species has a slightly amyloid reaction in the cuticle; however our material has a strongly amyloid reaction in this part. This species is very similar to *G. resinaceum*, differing only by the presence of a black band in the context. *Ganoderma stipitatum* Murrill (Murrill) and *G. elegantum* Ryvarden are other species with black bands in the context and a cuticle with cylindrical to club-shaped elements; however the former has smaller basidiospores (7.0–9.5 × 5.0–6.5 µm), and the latter has a long thin stipe and smaller pores (6–7 per mm)

Junghuhnia meridionalis (Rajchenb.) Rajchenb.
Aust. Syst. Bot. 16(4): 477, 2003. Figs 3–4, 6

Basidiomata annual, resupinate, very thin, soft when fresh, fragile and brittle when dried; pore surface dull red when fresh (8C3), becoming reddish-brown (8D4) when dried, pores regular, round to angular, 5–9 per mm; tubes concolorous with pore surface, up to 0.5 mm deep; subiculum concolorous with pore surface, up to 0.1 mm thick.

Hyphal system dimitic. Generative hyphae clamped, hyaline, thin-walled to slightly thick-walled, 2.0–4.0 µm wide; skeletal hyphae thick-walled, dominant in the trama and subiculum, 2.0–4.0 µm wide, hyaline to yellowish; n=20/1. Skeletocystidia abundant, embedded in the trama or projecting up to 40.0 µm above the hymenium, clavate, thick-walled, heavily incrusted, 8.0–14.0 µm diam.; fusoid cystidioles present. Basidia clavate, 4-sterigmate; basidiospores narrowly ellipsoid to ellipsoid, hyaline, smooth and thin-walled, 3.0–4.0 × 1.5–2.0 µm, Lm × Wm = 3.6 × 1.9, Q = 1.5 – 2.0, Qm = 1.9, n = 20/1.

Culture description: see Rajchenberg (2003).

Habitat: On dead hardwoods, associated with a white rot.

Distribution: According to Rajchenberg (2006) this species has an austral distribution, occurring in New Zealand, Argentina, and Chile.

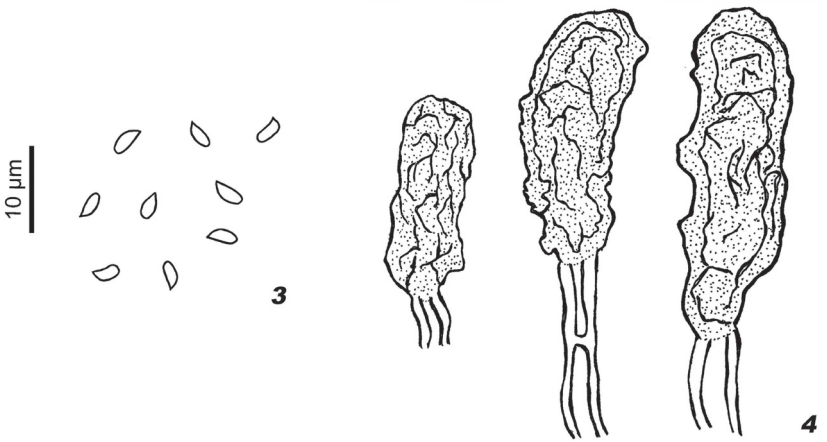

Fig. 3–4. Microscopic characters of *Junghuhnia meridionalis* (ICN 154079): 3. Basidiospores. 4. Cystidia

Specimen Examined: BRAZIL. Rio Grande do Sul State, municipality of Porto Alegre, Morro Santana, 04.V.2007, *leg. M.C. Westphalen 025/07* (ICN 154079).

Additional Specimens Examined: ARGENTINA. Neuquén, Quetrihué, 16.V.1952, *leg. R. Singer M-650* (BAFC 27996); Parque Nacional Lanín, Cascada Chacín, 19.V.1999, *leg. M. Rajchenberg 11924* (CIEFAP); BRAZIL. Rio Grande do Sul, municipality of São Francisco de Paula, FLONA-SFP, 22.VI.2009, *leg. M.C. Westphalen 238/09* (ICN 154290); municipality of Derrubadas, Parque Estadual do Turvo, 15.IX.2009, *leg. M.A. Reck 198/09* (ICN 154340); CHILE. Prov. Palena, Chaitén, 06.IV.1996, *leg. M. Rajchenberg 11086* (CIEFAP); CZECHOSLOVAKIA. Moravia, Vysoká, 08.VII.1989, *leg. P. Vampola s/n* (BAFC 32625 *Junghuhnia nitida*); YUGOSLAVIA. Corkola uvala, 21.X.1983, *leg. M. Tortic s/n* (BAFC 30988 *Junghuhnia collabens*).

Remarks: *Junghuhnia meridionalis* is a beautiful resupinate species that is characterized by the pinkish to cinnamon pore surface and the waxy soft consistency when fresh, becoming brittle upon drying. This species was first described as a variety of *J. collabens* (Fr.) Ryvarden (Rajchenberg 1988), but recently, using cultural and reproductive characteristics, Rajchenberg (2003) verified that *J. meridionalis* is an autonomous taxon. Our specimen fits the description given by Rajchenberg (1987), except for a small difference in pore size (5–9 pores/mm in our material, 6–8/mm in Rajchenberg's specimens). *Junghuhnia nitida* is a similar species that can have a cream to pink cinnamon colored hymenophore but differs microscopically in wider, broadly ellipsoid to ovoid, basidiospores (4.0–4.5 × 2.0–3.0 µm). *Junghuhnia collabens* is also a similar species, but it is darker brick-red to cocoa-brown, has larger pores 3–4/mm, and cylindric-allantoid basidiospores (3.5–5.0 × 1.0–2.0 µm); according to Rajchenberg (2003) this species grows mainly on conifers.

Fig. 5–6. Basidiomes.
5. *Ganoderma chalceum*.
6. *Junghuhnia meridionalis*.
Scale bar = 1 cm.

Acknowledgements

PROPESQ-UFRGS and CNPq (Brazil) are acknowledged for financial support. We also wish to thank MSc. Paula Santos da Silva for the technical assistance in the drawings and Dr. Peter Buchanan (Landcare Research, New Zealand) and Dr. Clarice Loguercio Leite (Universidade Federal de Santa Catarina, Brazil) for the critical review.

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